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TRAINING OF ELECTRICAL ENGINEERING CADRES IN THE USSR

Fulfillment of the great tasks assigned to the Soviet people by the 19th Congress of the Communist Party of the Soviet Union requires further improvement in the training of Soviet electrical engineering cadres.

Higher education in the USSR has made unparalleled progress during the Five-Year Plans. There are 150% more students at higher educational institutions in the USSR than in all the capitalist countries of Europe. Admissions to higher educational institutions and technical schools in the USSR have increased continuously and rapidly. Training of electrical engineers and technicians has improved year by year at such large establishments as the Moscow Power Engineering, Leningrad Electrical Engineering, and Ivanovo Power Engineering Institutes, as well as at the Leningrad, Kiev, Tomsk, Khar'kov, and other polytechnical institutes.

Cadres for electrification of the USSR are being trained not only at electrical engineering and polytechnical institutes, but also at mining and metallurgical, agricultural, and other types of higher educational institutions and technical schools.

We need technically trained specialists who are well versed in Marxism-Leninism and understand the laws of economic development of the socialist society. We need specialists who will demonstrate maximum initiative, persistence, and broad knowledge in their fields in order to complete the jobs of complex electrification, mechanization, and automatization of production processes and to introduce the newest scientific and technical achievements into the economy on a broad scale.

The training of electrical engineers should be based on the long-range development of the USSR national economy, not merely on the present Five-Year Plan. Many students now in school will begin their engineering activities at the end of the present Five-Year Plan. Young specialists should be able not only to absorb new techniques already applied to industry, agriculture, transport, etc., but also to participate in further development of techniques.

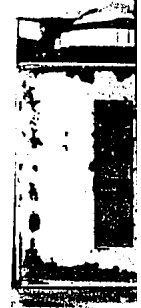
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Although the subjects of long-distance electric power transmission techniques, distribution installations, stability of electric power systems, complex mechanization of the electric power economy, and centralization and automatization of power-system control may be more or less adequately treated at the Moscow Power Engineering Institute and the Leningrad Polytechnical Institute, they receive inadequate attention at other higher educational institutions. Students are taught little about problems of dc power transmission. The above two institutes have excellent capabilities at this time for improving the teaching of this subject.

The problems encountered in electrical-machine-building and electrical-equipment-building, which are fields directly allied with electric power, are not adequately reflected in the curricula of specialties. The solution of one pressing problem, i.e., the preparation of cadres for planning and construction of high-power static converter installations, is not going well.

The "Electrification of Industrial Enterprises" course is of basic importance. Since automatization of production processes to a considerable extent involves automatization of electrical installations in enterprises, in the overwhelming majority of enterprises automatization of production processes is the job of specialists in this field.

In preparing specialists for electrification of transport, special attention should be devoted to reviewing contents of courses, particularly in the following subjects: centralization and automatization of traction-substation control, automatization of rolling-stock control, and automatization of safety devices. More attention should be given to ac electrification, to problems in the electrification of municipal, industrial, and mining transport, and to steam-electric traction.

In training engineers for the very important course "Automatic and Measuring Equipment," the most essential phases are the following: electrical measurement of electrical and nonelectrical quantities and the theory of converters (transducers) for use in production process control; automatic comparison of measurable quantities in electromechanical and electronic apparatus; and, finally, electronic-electromagnetic or amplidyne control elements acting directly on the regulators of any production process. This kind of specialist must create a series of universal systems and equipment for automatization applicable to all branches of the economy and science (computers). Engineers for this exceedingly important field are not yet being trained sufficient numbers, and even their course of studies has not yet been fully decided.

As a rule, in systems of telemechanization, centralized control, and dispatching of production and transport, electrical equipment is irreplaceable. In the complex mechanization and automatization of production processes, mechanization and automatization are closely allied, even if each proceeds by different paths. Thus they require a close creative association of production experts with designers, and of those engaged in electrification with those engaged in automatization. Changed technology often results, requiring a joint study of the problem by the production expert and electrical engineer. The education of nonelectrical engineers should include a higher percentage of electrical engineering subjects.

Neither the main administrations of the Ministry of Higher Education nor the main administrations of educational establishments of other ministries have devoted sufficient attention to the electrical engineering training of cadres in nonelectrical engineering institutions. Many polytechnical institutes with ample facilities have not fully coped with this problem. The Ministry of Higher Education must take decisive measures immediately to radically improve the electrical engineering training of students specializing in nonelectrical subjects, while other ministries must correspondingly supplement the program for training technical personnel of average qualifications for their enterprises and take measures to improve the qualifications of engineers and technicians already graduated.

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Aside from the qualitative side of cadre training in the system of branch ministries other than the Ministry of Higher Education, an insufficient number of electrical technicians are being graduated. It is not rare to find engineers working at jobs which could be successfully handled by technicians.

The growth of quantitative and qualitative requirements for training of electrical engineering cadres has made it acutely necessary for institutes, faculties, and technical schools to improve their physical plant, to fill out, train, and increase the qualifications of their scientific and teaching cadres, to build up their scientific research programs, to intensify their work on scientific methodology, to resolve questions of production and educational practices, and to intensify work on educational organization.

Only a few institutes and technical schools are coping with these problems. The Moscow Power Engineering Institute imeni Molotov, whose resourceful workers are carrying on considerable work in scientific methodology and scientific research, is yearly increasing the number and improving the quality of the specialists whom it graduates. But even in this institute the growth of physical and educational facilities has been lagging behind the growth of the student body. Some of the institute's professors are not providing progressive training for young scientific and teaching cadres. The development of more highly qualified scientific and teaching cadres -- professors and doctors of sciences in various electrical engineering specialties -- is not in accordance with the capabilities of this institute.

The Ivanovo Power Engineering Institute is not satisfactorily building up its physical and educational facilities. The rate of construction and expansion at the Leningrad Electrical Engineering Institute imeni Ul'yanov (Lenin) is insufficient. Construction of the Novosibirsk Electrical Engineering Institute, which is to be an important new center for training electrical engineering cadres, especially for the Ministries of the Communications Equipment Industry and Electrical Industry, has been delayed. In a number of polytechnical institutes, particularly the Chelyabinsk and Far East institutes, the educational and physical facilities of the electrical engineering faculties have been lagging considerably behind the growth of the student bodies.

The Ministries of Electric Power Stations, the Electrical Industry, the Communications Equipment Industry, and other ministries could greatly aid the Ministry of Higher Education in improving the physical plant of electrical engineering institutions and faculties by providing them with modern equipment. The Ministry of Machine and Instrument Building has set an example for this kind of cooperation.

At some institutes, the development of scientific and teaching cadres in electrical engineering subjects has also lagged noticeably behind the growth of the student bodies. The Chelyabinsk and Far East polytechnical institutes do not have enough highly qualified electrical engineers for scientific and teaching work. In this connection, more attention should be devoted to the training of doctors and candidates of sciences in electrical engineering subjects. This matter should be given a high priority not only within the system of the Ministry of Higher Education, but also in the power engineering and electrical engineering institutes of the Academy of Sciences USSR and republic Academies of Sciences, from which the higher electrical engineering education system has a right to expect effective assistance in supplying scientific and teaching cadres.

Scientific research institutes of the Ministries of Electric Power Stations, the Electrical Industry, and the Communications Equipment Industry, within whose system training of graduate students takes place, should aid the Ministry of Higher Education in filling up the scientific and teaching cadres of higher educational institutions.

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There are substantial deficiencies connected with the training of electrical engineering cadres. Curriculums are frequently revised without justification, resulting in the considerable methodological and organizational difficulties inherent in the operation of institutions with changing curriculums. The Ministry of Higher Education should draw up standard curriculums which would determine courses of training for specialists and which would remain stable for at least 5 years. Adjustments resulting from the rapid development of Soviet electrical engineering could be introduced into these programs without changing the basic curriculums.

The greatest number of electrical engineers are trained at power engineering faculties, very diversified in composition, of polytechnical institutes. At several institutes, courses ranging from thermal power engineering to radio engineering are represented in these faculties. The faculties of these institutes should be reviewed as to composition by subjects from the standpoint of uniform requirements for general engineering training. Also, higher educational establishments should be given the right to draw up working curriculums based on standard curriculums but always in view of the specific structures of their faculties.

Although considerable work has been done in recent years on the publications of text material for electrical engineering subjects, there is still a deficiency in the publication of text literature for such subjects as radio engineering, electronic and ionic techniques, automatic and measuring equipment, and electrification of individual branches of the national economy.

There are many defects in the methods and organization of practical work for electrical engineering students: this is limited to metalworking, mainly mechanical. The program of practical work offered to electrical engineers as a rule consists only of ordinary manual electric-arc welding. Even at such progressive institutions as the Moscow Power Engineering Institute and the Leningrad Electrical Engineering Institute, no practical work on spark machining or electrochemical processing of metals has yet been organized.

Students at electrical engineering faculties are not familiarized during the practical work programs with such modern methods as high-frequency metal hardening and ultrasonic defectoscopy. Moreover, these programs do not cover electrical assembly technology, repair of electrical machines and equipment, or construction of the simplest electrical instruments and equipment.

The actual execution of the practical work program also suffers from deficiencies. The blame lies chiefly with the industrial ministries involved; personnel of these ministries who are charged with organizing students' practical work often approach this important task from a narrowly departmental viewpoint. Moreover, if these personnel are in progressive enterprises, they are often unwilling to have the practical trainees, upon graduation, take superior techniques developed by these enterprises to other establishments.

The basis for successful training of electrical engineering cadres in any higher educational institution is thorough and continuous scientific research by its professors and instructors. This phase of their activities is the basic index of the quality of work of an institute, faculty, or chair. The solution of many of the most important electrical engineering problems is being successfully undertaken not only by higher educational institutions and scientific research institutes, but also by the scientific workers of the Moscow Power Engineering Institute and the Leningrad Electrical Engineering Institute, and by a number of electrical engineering chairs at Leningrad, L'vov, Kiev, Khar'kov, and Tomsk polytechnical institutes. However, the volume and importance of scientific work done in electrical engineering at some higher educational establishments is still quite insufficient.

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A defect of long standing which is unfortunately still current in the organization of scientific research is the isolation of scientific workers working on common problems relating to the national economy. Important problems connected with the great construction projects of Communism and with the complex electrification and automatization of the national economy are sometimes solved by separate scientific workers without coordination or exchange of opinions. The aspiration of some organizations to solve important scientific problems autonomously by their own resources and without consulting the most important scientists in our higher educational institutions is wrong and harmful. There can be different scientific schools and trends, each with its own advantages, since true science grows out of the struggle of opinions. But a decisive struggle must be conducted against isolationism in science, which brings nothing but harm.

The exchange of opinions among scientific workers in higher educational institutions is hindered in no small degree by the publishing activities of these establishments, whose trudy (works) are published from time to time. At the same time the publishing houses of the ministries do not devote enough attention to publication of the scientific works of institutes.

The training of graduate students in electrical engineering courses is lagging even more. Up to the present, the plan for admission of graduate students in electrical engineering, especially in electrical vacuum techniques, automatics and telemechanics, electrical instrument building, and radio engineering, has been incompletely fulfilled. Many graduate students in these subjects have completed their courses either without defending dissertations or by defending them only after considerable delay.

More attention must be devoted to the urgent task of eliminating all these deficiencies in the training of new engineering and scientific cadres in electrical engineering.

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